

# Farmersville DAC Water Energy Initiative

## ATTACHMENT 2

### WORKSHEET ASSUMPTIONS PROJECT 1



**Project 1:** Install 1,020 advanced water meters (Automatic Meter Reading or AMR meters) and convert all 2,556 water connections from a flat-rate billing system to an advanced metered and tiered billing system. This project will also include “Water wise” outreach and incentives. The City recognizes that the new metered water system has the potential to double or triple residents’ water bills. The City wants to ease this burden through water conservation education and providing practical tools and incentives to help residents use less water. The City will develop and distribute Water Wise bi-lingual literature to all of its customers and provide 1,000 showerhead and sink faucet flow restrictors. The City will also offer 200, \$100 rebates/billing credits to customers who purchase specified low-flush toilets (1.25 gallons per flush).

**1. Baseline Volume of Water for Project:** 716.6 MG/year

- a. Assumption: The City’s system wide annual water use (2014) is 716,604,900 or 716.6 MG/year. This is based upon actual use for one year between April 2013 and March 2014.

**2. Post Project Water Delivered:** 573.2 MG/year

- a. Assumptions: According to the California Single Family Water Use Efficiency Study, sponsored by the California Department of Water Resources, municipalities have experienced upwards of a 28.7% reduction in water use due to volumetric meter pricing and the ability to detect leaks in real time with advanced meters. The City of Farmersville is estimating a conservative 20% reduction in overall water consumption as a result of the conversion and water use behavioral changes. Residents currently pay a flat rate of \$14 for unlimited water. This often leads to wasteful water use outside including “overwatering” of lawns, use of water to clean porches, decks and wash cars. City leaders are quite confident that water use behaviors will change dramatically in Farmersville as residents realize the quantities of water for which they are actually using and billed.

**Methodology:** 716,604,900 gallons X 20% = 143,320,980 gallons saved

**716,604,900 – 143,320,980 = 573,283,920 volume delivered after implementation**

- b. In addition to the empirical evidence that behavior changes when water customers are billed for actual water use, the tools and incentives within this project will also help to achieve the 20% savings. (The tools include shower and sink faucet flow restrictor inserts and incentives to replace old toilets with ultra low flush models that use sixty percent less water than older models.)
- c. The conversion to a metered system is estimated to reveal household leaks and system leaks that have been previously undetected. This is estimated to make up

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7% of the 20% savings. According to the EPA WaterSense Website:

<http://www.epa.gov/WaterSense/pubs/fixleak.html> the average household's leaks can account for 10,000 gallons of water wasted every year. Ten percent of homes have leaks that waste 90 gallons or more per day (or 32,850 gallons per year).

#### 3. Volume of Hot Water Saved (Electric Heaters): 2.95 MG/year

- a. Assumption: 20% of the households use electric water heaters  
20% of 2556 connections = **511 homes**

- b. Assumption: According to the EPA WaterSense showers account for 16.8% (or 53.7 gallons per day) of indoor household water use. Website:  
<http://www.epa.gov/WaterSense/pubs/indoor.html>

**53.7** gallons per day X 365 days per year = **19,600 gallons** per year for showers per home

- c. Assumption: According to the EPA WaterSense faucets account for 15.7% (or 43.96 gallons per day) of indoor household water use.

**43.9** gallons per day X 365 days per year = **16,045 gallons** per year for faucets per home

- d. Assumption: According to the EPA WaterSense clothes washers account for 21.7% (or 60.7 gallons per day) of indoor household water use.

**60.7** gallons per day X 365 days per year = **22,177 gallons** per year for clothes washers

- d. Assumption: 50% of the water used for showers, faucets and clothes washers is HOT water.

19,600 gallons for showers per year, per household

+16,045 gallons for faucets per year, per household

+22,177 gallons for clothes washer per year, per household

=**57,822 gallons X 50% hot water = 28,911 gallons of hot water per year per home**

**511 homes X 28,911 = 14,773,521 gallons of hot water generated by electric hot water heaters.**

- e. Assumption: 20% reduction in hot water use based upon conversion to tiered volumetric billing and behavior changes including shower/sink converters, shorter showers and more conservative water use.

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20% reduction X 14,733,521 = 295,704 = 2.95 million gallons saved

#### 4. Volume of Hot Water Saved (Gas Heaters): 11.82 MG/year

- a. Assumption: 80% of the households use gas-fired water heaters

20% of 2556 connections = **2,045 homes**

- b. Assumption: According to the EPA WaterSense showers account for 16.8% (or 53.7 gallons per day) of indoor household water use. Website:

<http://www.epa.gov/WaterSense/pubs/indoor.html>

**53.7** gallons per day X 365 days per year = **19,600 gallons** per year for showers per home

- c. Assumption: According to the EPA WaterSense faucets account for 15.7% (or 43.9 gallons per day) of indoor household water use.

**43.9** gallons per day X 365 days per year = **16,045 gallons** per year for faucets per home

- d. Assumption: According to the EPA WaterSense clothes washers account for 21.7% (or 60.7 gallons per day) of indoor household water use.

**60.7** gallons per day X 365 days per year = **22,177 gallons** per year for clothes washers per home

- f. Assumption: 50% of the water used for showers, faucets and clothes washers is HOT water.

19,600 gallons for showers per year, per household

+16,045 gallons for faucets per year, per household

+22,177 gallons for clothes washer per year, per household

= **57,822 gallons X 50% hot water = 28,911 gallons of hot water per year per home**

**2,045 homes X 28,911 = 59,122,995 gallons of hot water generated by gas-fired hot water heaters.**

- g. Assumption 20% reduction in hot water use based upon conversion to tiered volumetric billing and behavior changes including shower/sink converters, shorter showers and more conservative water use.

20% reduction X 59,122,995 = 11,824,599 = 11.82 million gallons saved

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#### 5. Useful Life in Years of Project: 20 years

Assumption: According to manufacturer specifications, the Master Meter 3G advanced metering equipment has a guaranteed life of 20 years.

#### 6. Percentage of Imported Water: 0%

The City of Farmersville relies exclusively on its high quality local groundwater and does not import any water.

#### 7. Energy Intensity of System associated with project water savings: = 1,328.69 KWh/MG

**Assumption:** The KWh Usage per MG is derived from KWh usage for pumping groundwater from the City's 8 wells during the one year period in which 716.6 million gallons were delivered.

Date	Gallons Pumped	Electricity Utilized At Each Well (KW/h)						
		1a	3a	4a	5a	6a	7a	8a
Apr. 2013	58,078,000	0	0	4,979	0	4,129	19	66,440
May 2013	71,101,400	0	0	7,157	1	712	6,399	79,285
June 2013	84,019,700	0	19,782	2,337	380	269	23,692	69,466
July 2013	91,685,900	0	43,280	150	12,761	18	5,499	54,630
Aug. 2013	83,598,300	0	42,998	309	9	19	5,957	51,722
Sep. 2013	71,595,500	0	43,156	140	8	17	210	53,707
Oct. 2013	58,832,600	1	43,803	124	8	18	30	34,943
Nov. 2013	45,008,800	0	49	212	8	55	667	63,397
Dec. 2013	38,492,900	18	0	165	36	19	19	51,174
Jan. 2014	39,572,300	0	0	120	7	17	498	49,785
Feb. 2014	33,034,000	0	0	444	89	18	864	49,337
Mar. 2014	41,585,500	0	0	145	0	20	1,399	55,022
<b>Total</b>	<b>716,604,900</b>	<b>19</b>	<b>193,068</b>	<b>16,282</b>	<b>13,307</b>	<b>5,311</b>	<b>45,253</b>	<b>678,908</b>
<b>Total Electric Use all Wells</b>		<b>952,148 KW/h</b>						

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#### **CALCULATION:**

952,148 KW/716.6 MG = 1328.69

The City uses ~1328.69 KW/h of electricity to pump one million gallons of water.

**8. Total Output Emission Rate (default value):** 0.278 kg CO<sub>2</sub>e/kWh

Assumption: Using default value of 0.278 kg CO<sub>2</sub>e/kWh.

**9. EI associated with Supply and Conveyance:** The City of Farmersville does not import any water. Zero was entered for this value.

**10. Additional Annual Energy Savings:** There is no additional Energy Savings Associated with this project.